

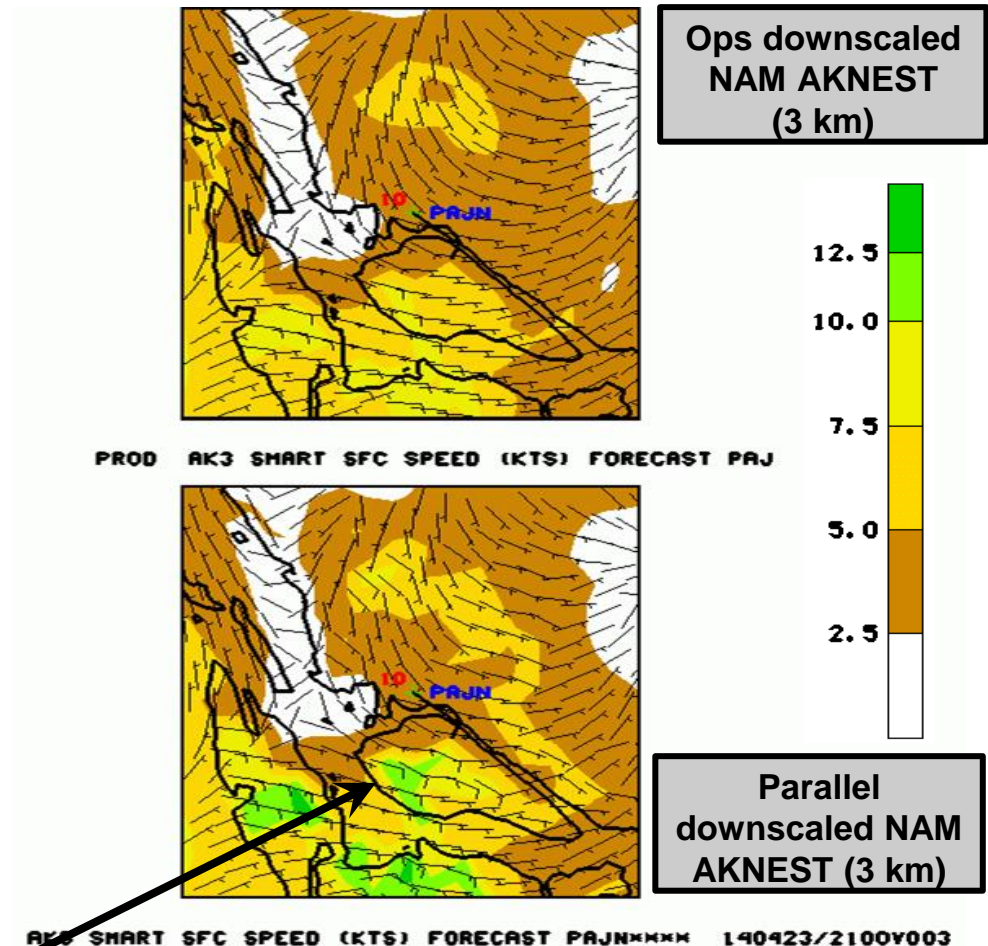
Updates to smartinit downscaling in 2014-2015

April 17, 2015
NCEP/EMC

August, 2014 V3.2.8

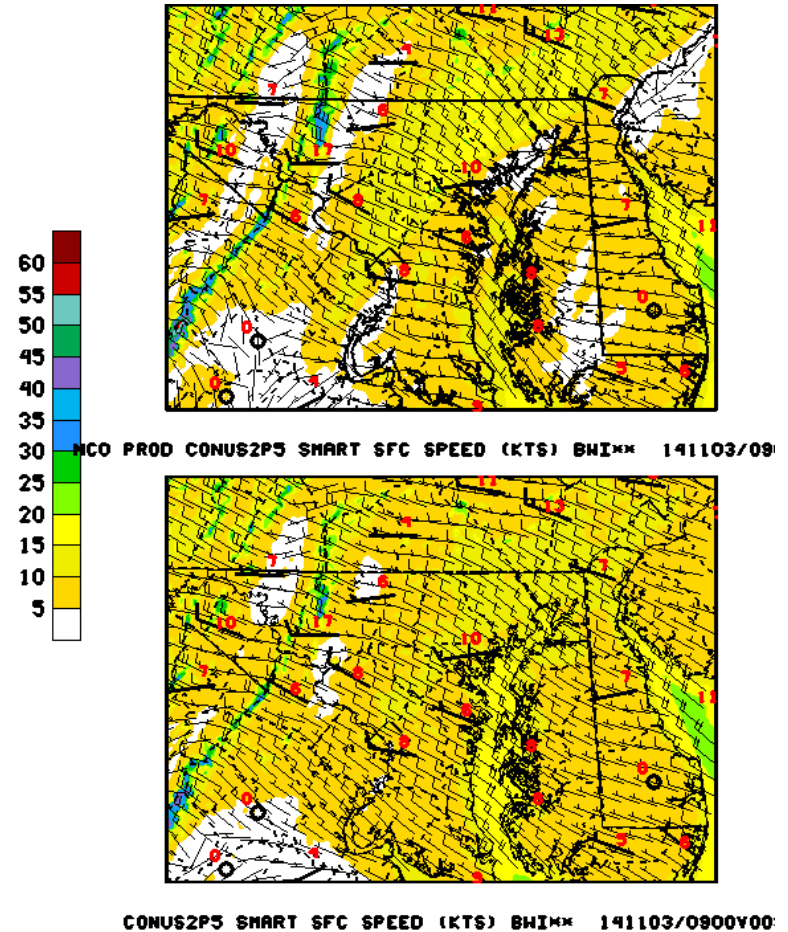
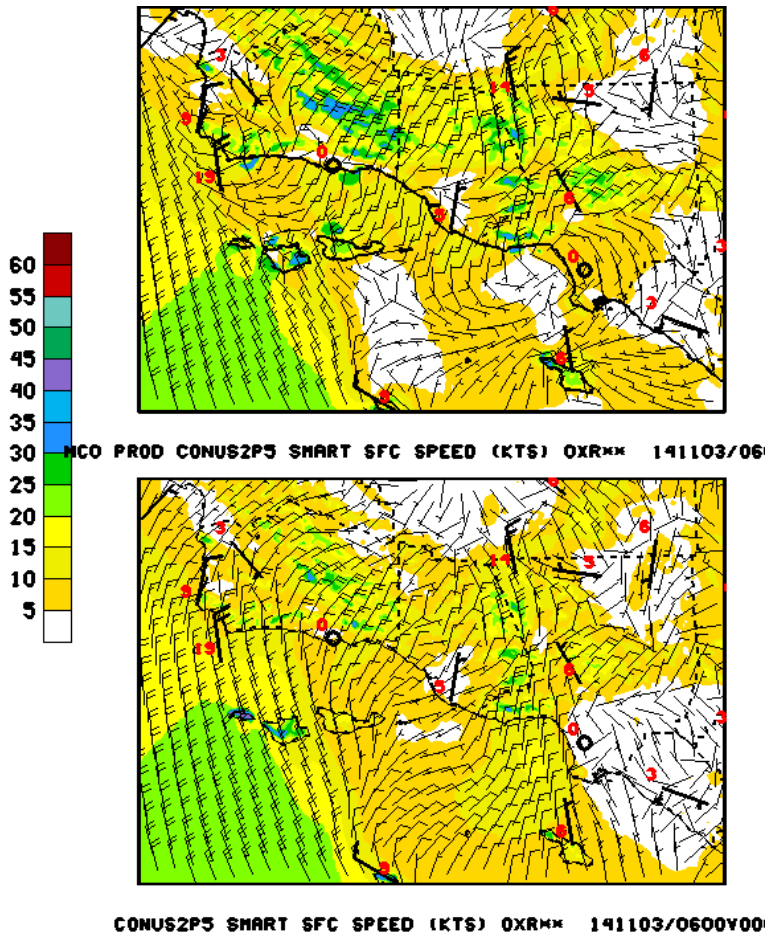
Changes to Downscaled Grids

- 5 km CONUS / 6 km Alaska DNG grids extended to 192-h via DGEX
- Addition of Haines Index for Fire weather
- Improved 10-m wind treatment
 - Use mass-consistent wind field model
 - Based on velocity potential, incorporating local terrain gradients
- DGEX extension will not be on AWIPS simultaneously with NAM implementation, this will probably occur sometime during fall 2014.



Improved representation
of the effects of local
terrain on winds

Correction to NAM/DGEX Wind Downscaling Into Production on Nov. 13, 2014 12 UTC



Diagnostic Wind Downscaling Correction

- ❑ Compute the velocity potential
 - solve the Poisson Eqtn using Gauss-Seidel Method from the terrain gradients

$$U = U + S^*(PHI_{i+1} - PHI_{i-1})/\Delta X$$

$$V = V + S^*(PHI_{i+1} - PHI_{i-1})/\Delta Y$$

where

$$PHI = U * \Delta Z / \Delta X + V * \Delta Z / \Delta Y = \text{velocity potential}$$

$$\Delta Z_m = \text{parent model topography}$$

$$\Delta Z_d = 2.5 \text{ km NDFD grid topography}$$

$$S = \text{Abs}(\Delta Z_m - \Delta Z_d) / \Delta Z_d \text{ (implemented 11/13/14)}$$

Smartinit upgrade Q2FY15

V3.3.3

❑ Haines Index for NAM/DGEX on AWIPS

- Correction to AWIPS version
 - ❖ Error in Dewpoint depression calculation
 - ❖ Error in lower limit
- modified to use WMO headers

❑ Corrected T-1, T-2 hours time stamp

❑ Integrated smartinit code with GFS DNG

- *smartinit.fd* changes

Haines Index Upgrade

V3.3.3

❑ Measure of fire growth potential

- combines both the instability and dryness of the air by examining the lapse rate between two pressure levels and the dryness of one of the pressure levels.
- 2 = moist, stable, 6 = dry, very unstable atmosphere

❑ $HI = HI_t + HI_m$

- $HI_t = \text{Slope}_t * \Delta T + \text{Intercept}_t$
- $HI_m = \text{Slope}_m * T_{d-dep} + \text{Intercept}_m$
where $T_{d-dep} = (T_p - T_{d_p})$: dew point depression

$$\diamond T_d = (R * 237.3) / (1.0 - R)$$
$$R = \log(RH_p) / 7.5 + (T_p / (T_p + 237.3))$$

Haines Index

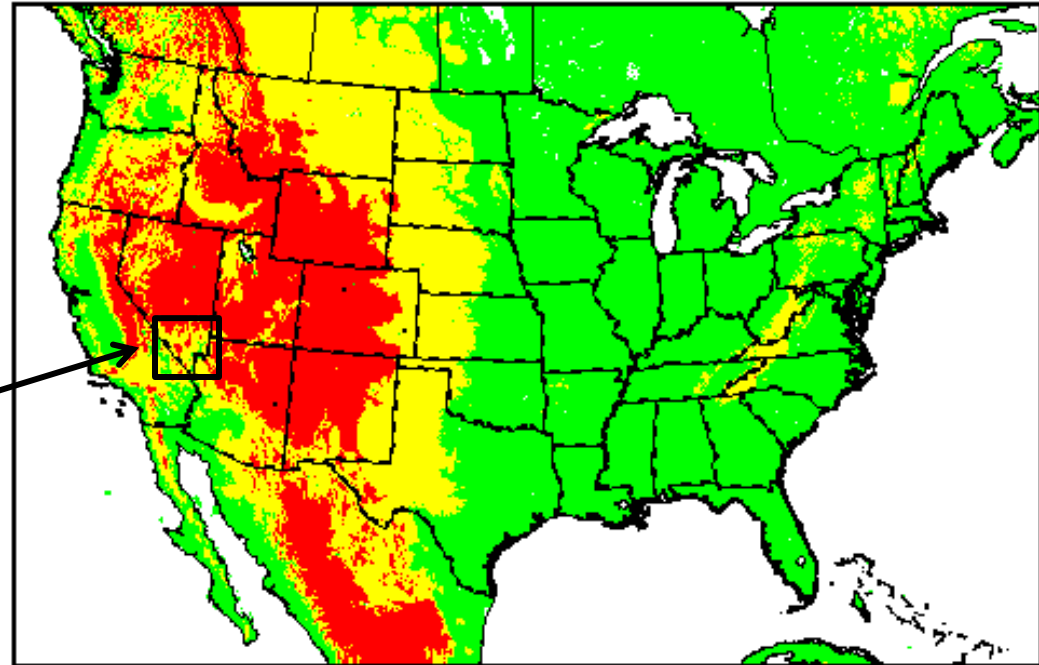
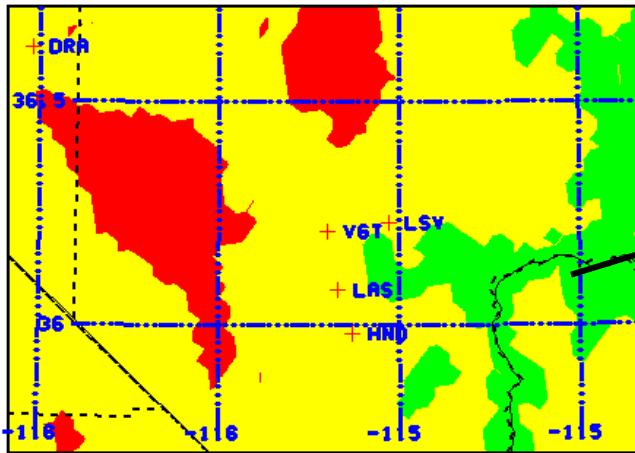
D.A. Haines, 1988, Nat. Wea. Dig

Level	ΔT	P level for T_p	Std T Lapse	T interc	Std Td Lapse	Td intercpt
Low Psfc>950mb Zsfc <540m	$T_{950} - T_{850}$	850 mb	0.2	1.0	0.2	0.6
Middle Psfc>850mb Zsfc<1456m	$T_{850} - T_{700}$	850 mb	0.183	0.75	0.125	0.9375
High Psfc<850mb Zsfc>1456m	$T_{700} - T_{500}$	700 mb	0.2	-1.8	0.143	-0.428

For DNG, corresponding standard atmosphere elevation used instead of varying surface pressure

- To provide static low/middle/high reference level required for effective use by forecaster

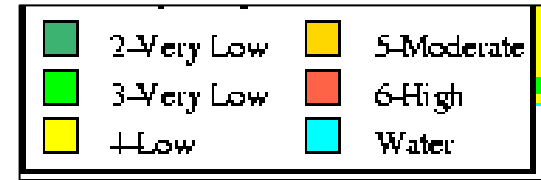
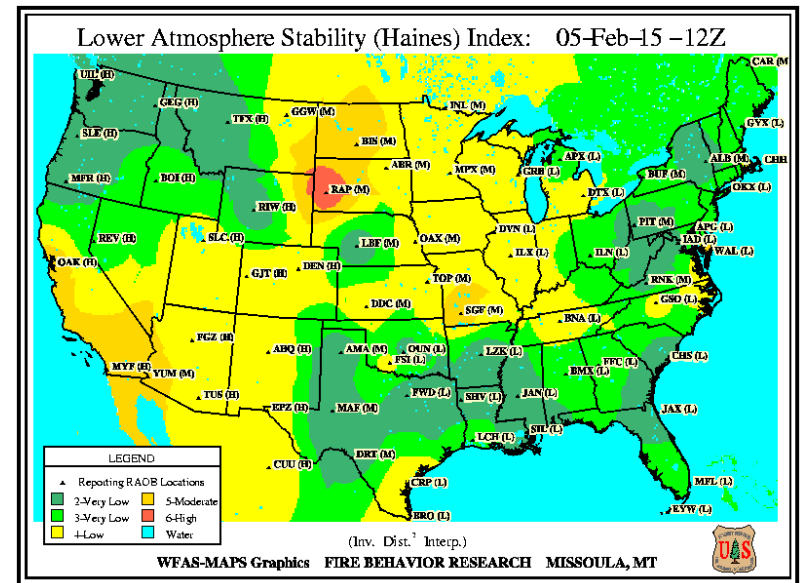
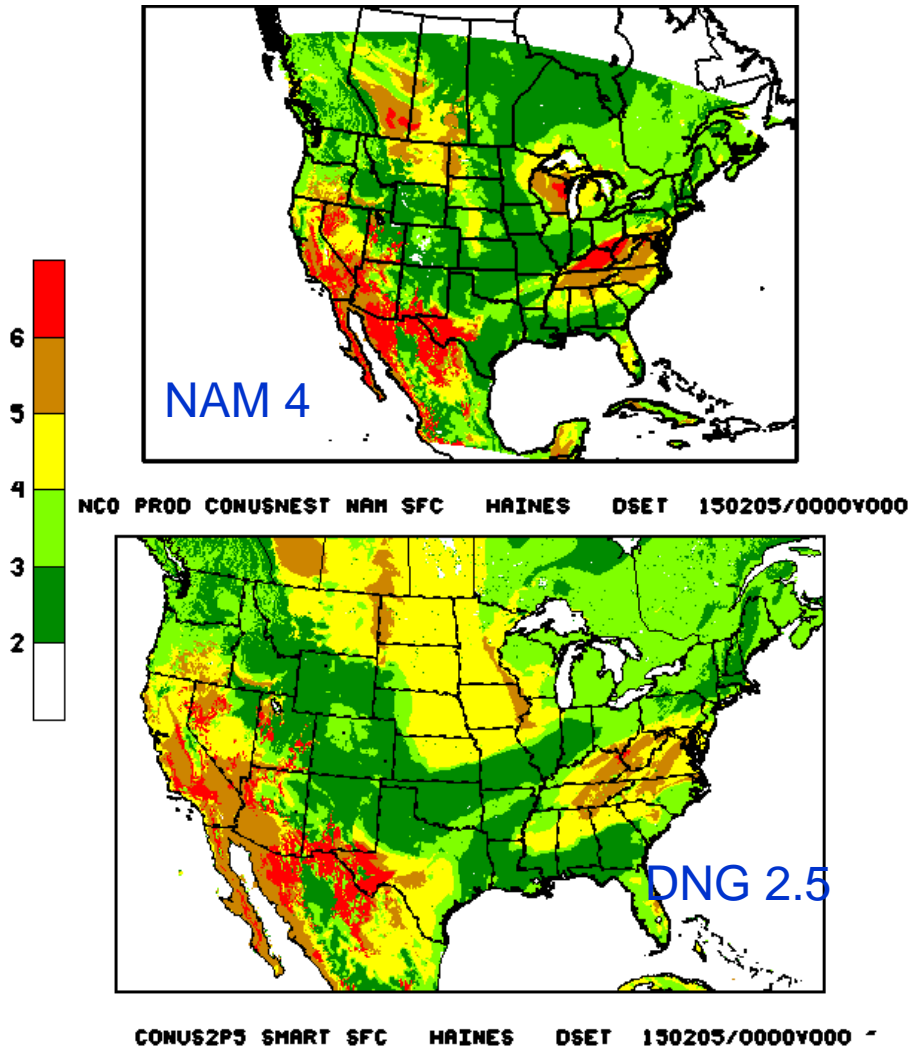
Calculation Reference Level from ground elevation



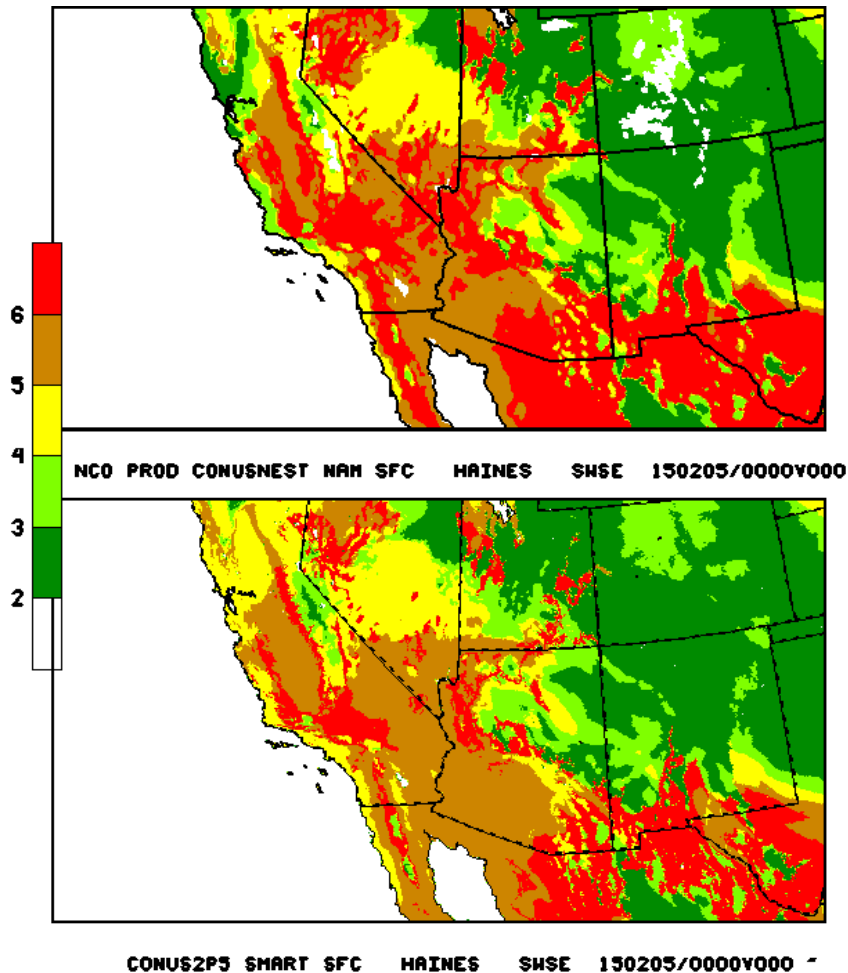
1(green <540 m) = use low level Haines Index calculation
2(yellow <1456 m) = use mid level Haines Index calculation
3(red >1456 m) = use high level Haines Index calculation

NAM CONUS Nest vs DNG 2.5 km

Haines Index: Feb 5, 2015, 12 UTC

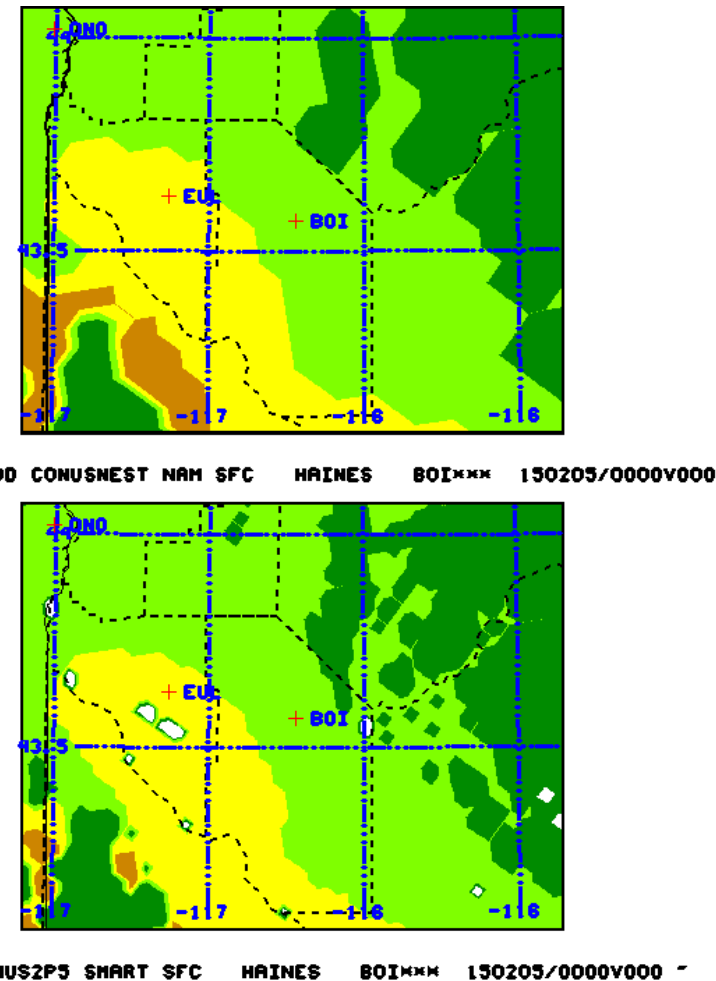


CONUS Nest vs DNG 2.5 km

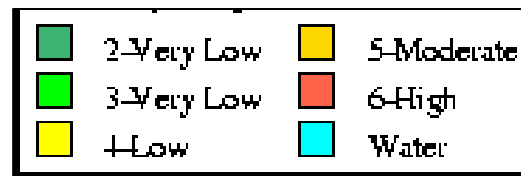


Nest 4

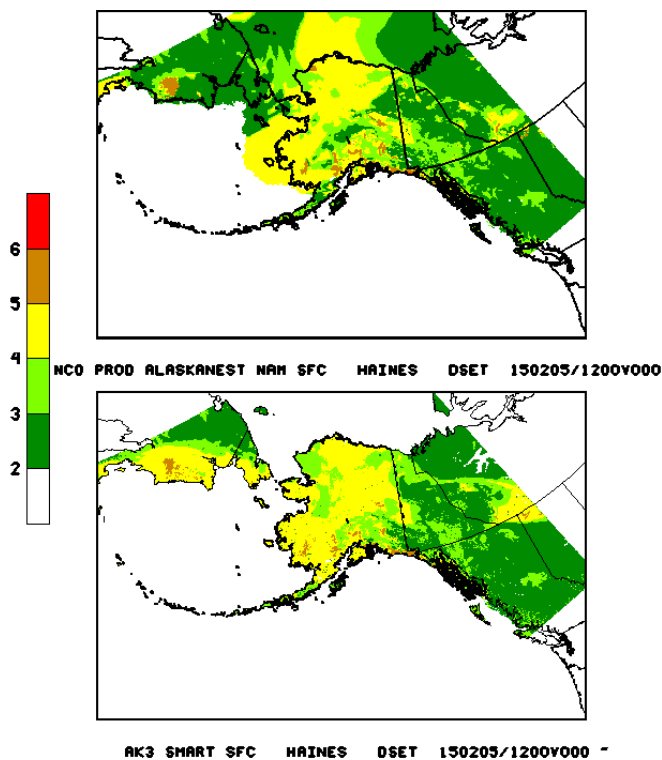
DNG 2.5



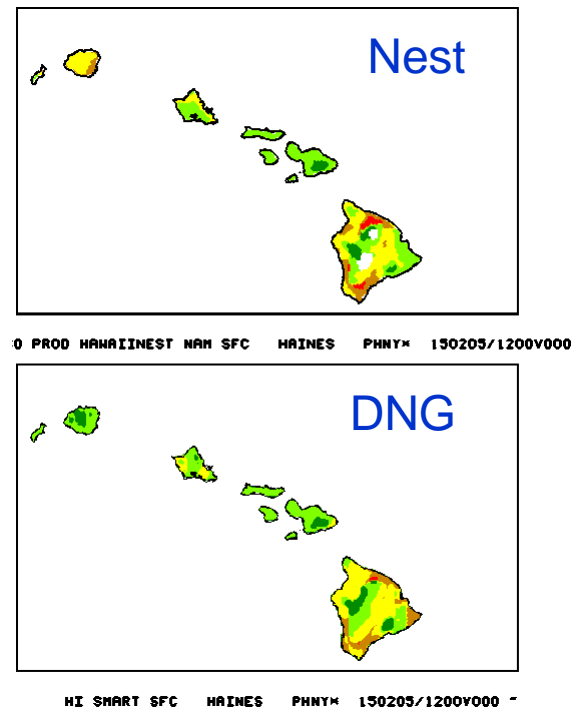
Boise, Idaho



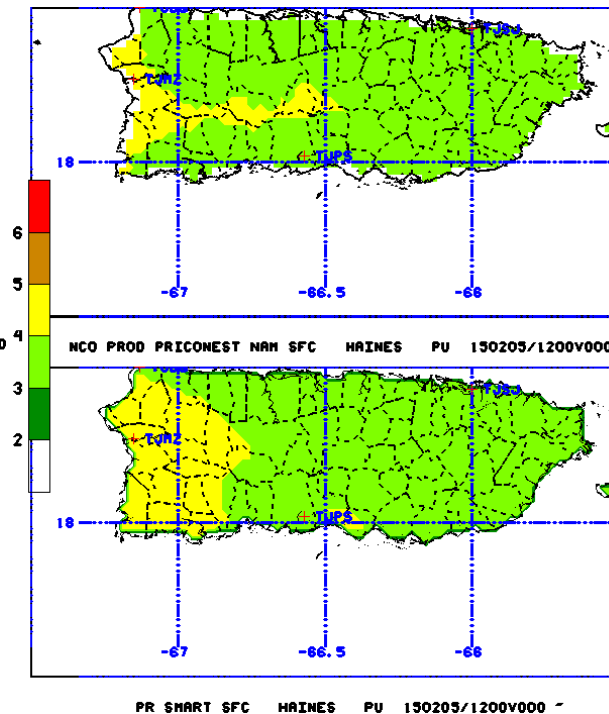
CONUS Nest vs DNG 2.5 km



Alaska



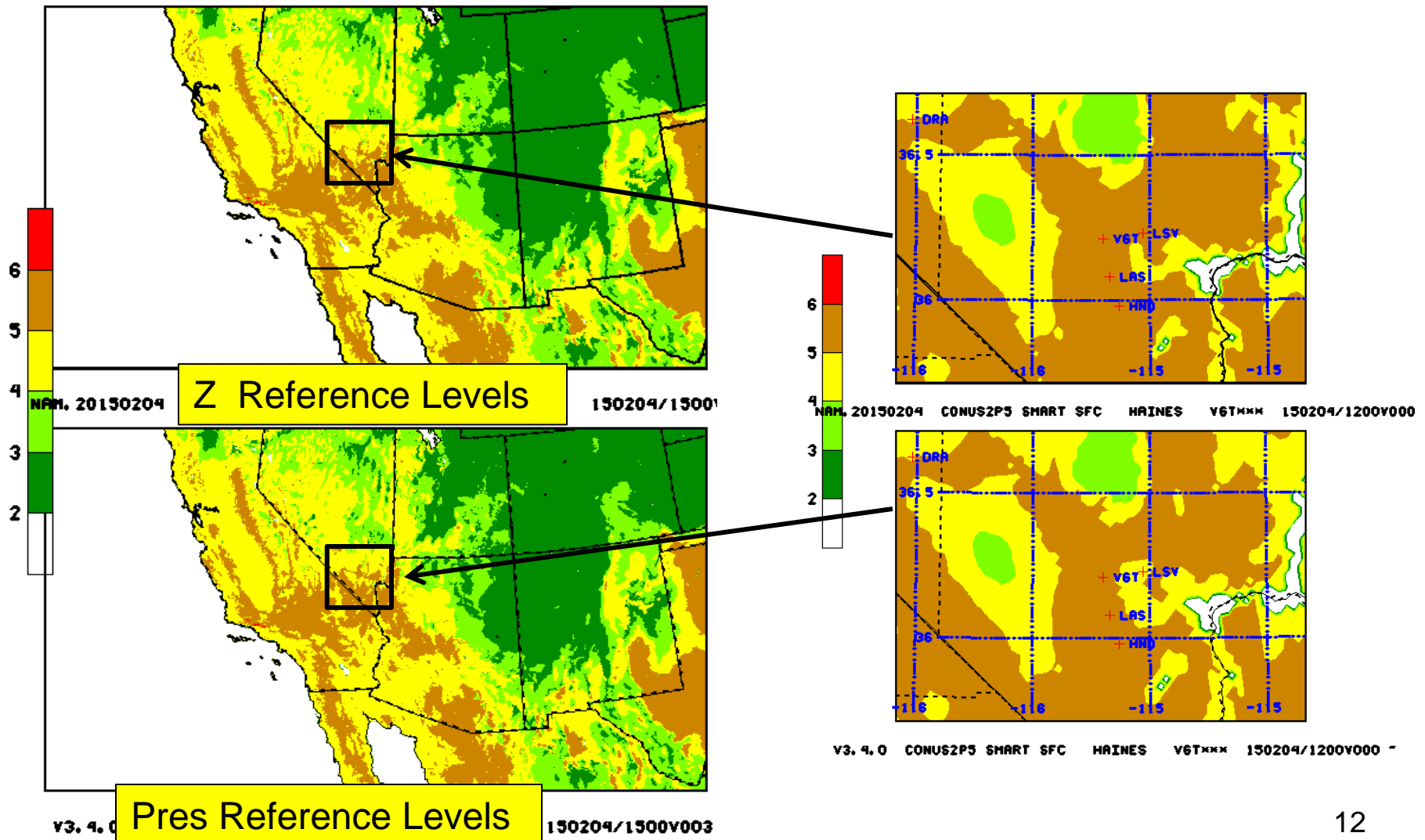
Hawaii



Puerto Rico



Comparison of Z vs P reference level approach



Summary

❑ Haines Index

- Using static reference levels
- AWIPS DRG written (NWS fire weather)
- AWIPS WFO headers developed (NCO)
- Correction to computation
- Similar to NAM nest outputs
- Higher than Raob based Haines Index

❑ Synchronized with GFS

- One executable for GFS/NAM/DGEX/HRW & various domains
 - ❖ CONUS 2.5 and 5 km
 - ❖ Alaska 6 and 3 km
 - ❖ Guam 2.5 km (from GFS and HRW)
 - ❖ Hawaii, Puerto Rico



Q3FY15 Smartinit Downscaling Upgrade

Project Status as of 01/15/2015



Project Information and Highlights

Lead: Jeff McQueen, Manuel Pondeca, EMC and Chris Magee, NCO

Scope: Significant upgrade that introduces:

- Expanded CONUS 2.5 km domain;
- GRIB2 input/output;
- Physics upgrade (adiabatic wind adjustments, improved coastline adjustments for lakes, temperatures in valleys);
- NLDAS 2 m temperature, spec. humidity option;
- New products (significant weather, 80 m winds for Energy)
- Code optimization with EMC;

Expected Benefits:

1. Improved winds and temperatures in complex terrain
2. Address forecaster concerns around coastlines and in valleys
3. Provide improved background fields for RTMA/URMA



Scheduling

Milestone (NCEP)	Date	Status
Initial coordination with SPA team	Developer	3/01/15
EMC testing complete / EMC CCB	Developer	4/01/15
Final Code Delivered to NCO	Developer	4/04/15
Technical Information Notice Issued	Developer	5/1/15
SPA begins prep work for 30 day test	NCO	5/1/15
30-day evaluation begins	NCO	6/1/15
30-day evaluation ends	NCO	6/1/15
IT testing ends	NCO	
Management Briefing	NCO	6/10/15
Operational Implementation	NCO	6/15/15



Issues/Risks

Issues:

Risks:

Mitigation:



Finances

Associated Costs:

Funding Sources: EMC Base: T2O 3 man-months NCO Base: 1 man-months for implementation, 1 man-month annually for maintenance

